

Remarks

Rejection Under 35 U.S.C. § 112, second paragraph

Claims 1-3, 5, 6, 8-10, 12, and 16-20 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. It appears that the Examiner intended to refer to claims 1-3, 5, 6, 8-10, 12, and 16-18 since claims 19 and 20 were previously canceled. In particular, the Examiner alleged that the meaning of the term “non-interactive” is unclear. Additionally, the Examiner alleged that claim 12 and its dependent claims were unclear since they contained process steps. Applicants respectfully traverse this rejection to the extent that it is applied to the claims as amended.

Independent claims 1 and 12 have been amended to further define the term “non-interactive side chains” by specifying that “the non-interactive side chains do not interact or bind with the charged surface.” Support for this amendment can be found in the specification at least at page 8, lines 16-17 and page 10, line 3. Therefore the meaning of the term “non-interactive” is clear to one of ordinary skill in the art, particularly when read in light of the specification.

Further claims 8-10 specify that the non-interactive side-chains are poly(ethylene glycol) chains. Therefore, for this additional reason, the scope of claims 8-10 is clear to one of ordinary skill in the art.

Independent claim 12 has been amended to specify that the sliding surfaces are in a device or machine. Dependent claims 13, 14, 17 and 18 have been amended to refer to the “device or machine” of claim 12 in view of the amendment to claim 12. Support for this

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amendment can be found in the specification at least at page 10, line 10. Contrary to the Examiner's assertion at page 2, third full paragraph of the Office Action, independent claim 12 does not refer to "process steps". Claim 12 defines the components in the lubricating composition, specifies the location of the lubricating composition within the device or machine and defines a property of the lubricated surface.

Therefore claims 1-3, 5, 6, 8-10, 12, and 16-18 are definite.

Rejection Under 35 U.S.C. § 102/103

Claims 1, 5, 8-10, and 12 were rejected under 35 U.S.C. § 102(a) as being anticipated by, or in the alternative under 35 U.S.C. § 103(a) as being obvious over, JP 2002-060772 to Toshiaki ("Toshiaki"). Claims 1, 5 and 12 were rejected under 35 U.S.C. § 102(b) as being anticipated by, or in the alternative under 35 U.S.C. § 103(a) as being obvious over, U.S. Patent No. 5,726,230 to Murata ("Murata"). Claims 1-3, 5, 6, 8, 9, 12, and 16-18 were rejected under 35 U.S.C. § 102(e) as being anticipated by, or in the alternative under 35 U.S.C. § 103(a) as being obvious over, U.S. Published Application No. 2003/0087111 to Hubbell *et al.* ("Hubbell"). Claims 12, 17 and 18 were rejected under 35 U.S.C. § 102(e) as being anticipated by, or in the alternative under 35 U.S.C. § 103(a) as being obvious over, U.S. Published Application No. 2002/0143081 to Li *et al.* ("Li"). Claims 12, 17 and 18 were rejected under 35 U.S.C. § 102(b) as being anticipated by, or in the alternative under 35 U.S.C. § 103(a) as being obvious over, WO 00/65382 to Textor *et al.* ("Textor"). Claims 1, 5, 8-10, and 12 were rejected under 35 U.S.C. § 102(e or b) as being anticipated by, or in the alternative under 35 U.S.C. § 103(a) as being

obvious over, U.S. Patent No. 6,548,460 to Higai *et al.* ("Higai"). Applicants respectfully traverse this rejection to the extent that it is applied to the claims as amended.

Toshiaki

The undersigned points out that the comments provided herein with respect to Toshiaki are based on an English translation of a Japanese patent, which was prepared by computer. This translation is difficult to understand since it does not conform to standard English grammatical rules.

Toshiaki discloses coating water tanks and pipes with friction reduction agents prior to placing them underground to facilitate placement of the tanks and pipes in the soil (*see para.* 0001). The film reduction agent contains (a) a water-absorbing resin, (b) a hydrophilic binder, and (c) a solvent (abstract). Example 1 describes forming a water-absorbing resin containing Polyethyleneglycol diacrylate and a crosslinking agent (*see para.* 0069). The reaction described in Example 1 formed a crosslinked polymeric gel, which swells in the presence of water. This copolymer does not have the structure required by amended claim 1. Support for the amendment to claim 1, which further defines the structure of the graft copolymer, can be found in the specification at least at page 6, lines 6-16. The graft copolymers listed in claim 1 do not form gels that swell greatly in the presence of water. Further, Toshiaki discloses that the solvent used when coating the tanks and pipes should be an organic solvent to prevent swelling and thereby facilitate spreading of the friction reduction agent on the surface (*see para.* 0054). In contrast, independent claims 1 and 12 specify that the lubricating composition contains an aqueous

medium. Further, Toshiaki does not disclose lubricating surfaces within a device, as required by claim 12. Therefore claims 1, 5, 8-10, and 12, as amended, are novel in view of Toshiaki.

The claimed methods and devices are also non-obvious in view of Toshiaki. As noted above, Toshiaki discloses using different polymers to form swellable gels. The solvent used when coating the tanks and pipes should be an organic solvent. The compositions are applied to an outer surface of a tank or a pipe. One of ordinary skill in the art would not be motivated to modify Toshiaki to use a graft copolymer in an aqueous medium, as required by independent claims 1 and 12. Additionally, Toshiaki focuses on placing a pipe in the ground; it does not disclose or suggest lubricating two sliding surfaces within a device. Therefore, claims 1, 5, 8-10, and 12, as amended, are non-obvious in view of Toshiaki.

Murata

Murata discloses an aqueous coating composition that contains a particulate water-dispersible resin and an ester of a polyglycerin ether with a fatty acid dissolved or dispersed therein (col. 2, lines 1-4 and 11-15). The preferred formula for the polyglycerin ether with a fatty acid is provided at col. 6, lines 60-67. This polymer does not contain a polyionic backbone, as required by independent claims 1 and 12. The water-dispersible resin is typically a graft reaction product of an epoxy resin, preferably the product of an aromatic epoxy resin and a carboxyl-containing acrylic resin (*see* col. 2, lines 37-40). Enclosed is a typical structure and description for an aromatic epoxy resin (Epoxy Resin @ 3Dchem.com, <http://www.3dchem.com/molecules.asp?id=326#>). The water-dispersible resin may be formed

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by a conventional graft polymerization reaction in which the aromatic epoxy resin reacts with a carboxyl-containing radically polymerizable unsaturated monomer in the presence of a radical generating agent (col. 5, lines 4-14 and 23-30). The graft reaction product typically has a crosslinkable functional group, such as a hydroxyl group, which is exposed to a crosslinking agent to crosslink the molecule (col. 6, lines 14-24). Thus the resulting water-dispersible resin does not contain the structure required by independent claim 1 or 12. The water-dispersible resin is a crosslinked molecule; it does not contain a polyionic backbone with non-interactive side chains grafted onto the backbone, as required by the claims. Further, Murata does not disclose lubricating sliding surfaces within a device, as required by claim 12. Therefore claims 1, 5 and 12 are novel over Murata.

The claimed methods and devices are also non-obvious in view of Murata. As noted above, Murata discloses using different polymers to form crosslinked molecules. The aqueous coating compositions are applied to one surface on a sheet which is used to form a can. One of ordinary skill in the art would not be motivated to modify Murata to use a lubricating composition comprising a graft copolymer, as defined by independent claims 1 and 12. Additionally, Murata focuses on coating a surface of a can; it does not disclose or suggest lubricating two sliding surfaces within a device. Therefore, claims 1, 5, and 12, as amended, are non-obvious in view of Murata.

Hubbell

Hubbell discloses compositions for coating biological and non-biological surfaces to minimize or prevent cell-cell contact and tissue adhesion. The compositions contain polyethylene glycol (PEG)/polylysine (PLL) copolymers (abstract). Hubbell does not disclose or suggest methods for lubricating two sliding surfaces, nor devices or machines containing two sliding surfaces, whereat least one surface is a lubricated surface. With respect to coating non-biological surfaces, Hubbell indicates that these surfaces are “intended to be placed in contact with a biological environment.” (para. 0089) These are not devices or machines with two sliding surfaces that contact each other. Further, with respect to the method claims, Hubbell applies the coating to one surface, such as the surface of a device (see para. 0094 and 0095). In contrast, independent claim 1 specifies that the lubricating composition is placed between two sliding surfaces. Therefore claims 1-3, 5, 6, 8, 9, 12, and 16-18 are novel in view of Hubbell.

Hubbell's compositions are designed to minimize or prevent cell-cell contact and tissue adhesion. A composition can be effective at preventing *adhesion* between two surfaces, as disclosed in Hubbell, but not be useful at *reducing friction* between two surfaces. For example, when one walks in sneakers on a side walk, there is a high friction coefficient between the sole of the sneaker and the side walk (which prevents one from slipping on the sidewalk), but the sneaker does not adhere to the sidewalk, i.e. low adhesion. In contrast, if water is placed between two flat glass surfaces, the glass surfaces will adhere to each other, i.e. high adhesion, but they will easily slide against each other, i.e. low friction coefficient. Therefore, the fact that

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a give composition prevents adhesion of proteins to a surface does not indicate to one of ordinary skill in the art whether the same composition could function as a useful material in reducing the friction coefficient between two sliding surfaces. One of ordinary skill in the art would not be motivated by Hubbell's disclosure to practice the claimed method for lubricating two sliding surfaces or to form the claimed devices and machines. Therefore claims 1-3, 5, 6, 8, 9, 12, and 16-18, as amended, are non-obvious in view of Hubbell.

Li

Li discloses amphiphilic latex nanoparticles containing a core and a shell, where the core contains a hydrophobic vinylic grafted copolymer and hydrophobic vinylic homopolymer and the shell is a hydrophilic, nitrogen containing polymer (abstract). Contrary to the Examiner's assertion at page 6, third full paragraph, Li's copolymers do not contain a polyionic ***backbone***, instead Li discloses that the ***sidechains*** may be charged water soluble polymers, such as polyethylene imine (PEI) (*see* Figure 1 and abstract). Therefore Li's copolymer is structurally different from the copolymer that is contained in the lubricating composition. Further, as discussed above with respect to Hubbell, Li does not disclose placing its copolymer in a device or machine between two sliding surfaces. Therefore, claims 12, 17 and 18, as amended, are novel in view of Li.

Further, Li does not disclose or suggest modifying its copolymer so that the copolymer has a polyionic backbone and non-interactive sidechains, with the structure defined in claim 12 and its dependent claims. Li focuses on forming well-defined core-shell nanoparticles, and Li's

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method is specifically directed to forming graft copolymers having this particular structure (*see* para. 0003, last sentence; and para. 0014). Further, Li is directed at using its nanoparticles for targeted drug delivery (para. 0146-0148), diagnostic tests (para 0149-0150), agglutination tests (para. 0151-0152), gene delivery (para. 0153-0154), water treatment applications (para. 0155-0156), and forming coating for leather finishing, paints, paper and textile industries (para. 0158). The Examiner points to the disclosure at para. 00128 and 00129 of Li, which states that a latex dispersion was dried on a glass surface. However, the mere disclosure of placing a material on a glass surface does not disclose or make obvious the claimed devices or machines. Li does not suggest a device or machine that contains a lubricating composition between two sliding surfaces. In fact, Li contains no disclosure relating to how to reduce the friction coefficient between two sliding surfaces. One of ordinary skill in the art would not be motivated to modify Li's disclosure to form the claimed devices and machines. Therefore claims 12, 17 and 18, as amended, are non-obvious in view of Li.

Textor

Textor discloses methods improved analytical and biosensing devices. A copolymer, which contains a charged portion and non-interactive side chains, is coated or applied onto the surface of the analytical or biosensing device. The charged portion of the copolymer adsorbs onto the surface, while the non-interactive side chains form a dense structure that ***prevents the adsorption*** of molecules or ions onto the surface, making the surface resistant to non-specific adsorption of proteins. Further, Textor does not disclose devices or machines containing two

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sliding surfaces where at least one of the surfaces is a lubricated surface, as required by claim 12, as amended. Therefore 1-3, 5, 6, 8, 9, 12, and 16-18, as amended, are novel in view of Textor.

Further, Textor does not suggest modifying its sensing devices to contain two sliding surfaces, let alone where at least one surface is a lubricated surface. Textor is directed at *preventing non-specific adsorption on the surface* of an analytical or sensing device.

Modifying a sensing device to contain a tow sliding surfaces where at least one is lubricated would prevent the analytical or sensing device from being a useful sensor.

Further, as noted above with respect to Hubbell, the disclosure that a given material is effective at preventing adsorption of proteins to a non-biological surface does not provide one of ordinary skill in the art with any information regarding whether the same material could be useful as a lubricant. Textor contains no disclosure relating to how to reduce the friction coefficient between two sliding surfaces. One of ordinary skill in the art would not be motivated to Textor's analytical or sensing devices to form the claimed devices or machines which contain two sliding surfaces. Therefore claims 12, 17 and 18, as amended, are non-obvious in view of Textor.

Higai

Higai discloses a coating composition that includes a methacrylic resin. The methacrylic resin is formed by copolymerizing styrene or a substituted styrene, a methacrylic ester obtained from an alcohol with at least twocar bon atoms and methacrylic acid and an olefinic compound with at least one carboxylic group (abstract). The coating composition is applied to metal sheets

to improve a number of their properties during manufacturing processes, such as press formability. The coating composition dissolves off of the metal sheet when it is exposed to alkaline solution (*see* col. 5, lines 39-40). The coating compositions described in Higai are methacrylic resins prepared by copolymerizing three components: styrene or a substituted styrene (A); a methacrylic ester (B); and an olefinic compound having at least one group (C) (abstract and the examples), which are different than the AB copolymers defined in the claims. Further, the materials defined in Higai appear to be random copolymers; the claims, as amended, require block copolymers. Additionally, with respect to claim 12, Higai does not disclose devices or machines containing two sliding surfaces where at least one of the surfaces is a lubricated surface. Thus, claims 1, 5, 8-10, and 12, as amended, are novel and non-obvious over Higai.

Rejection Under 35 U.S.C. § 103

Claims 9 and 10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Hubbell in view of U.S. Published Application No. 2001/0049105 to Singh et al. ("Singh"). Applicants respectfully traverse this rejection to the extent that it is applied to the claims as amended.

Hubbell in view of Singh

Claims 9 and 10 depend from claim 1, which is discussed above. As noted above, Hubbell is directed at preventing fouling on the surface of a device, i.e. preventing the adsorption of a protein layer on the surface of the device when the device is in contact with biological fluids (*see* para. 0092). Hubbell contains no disclosure relating to how to reduce the friction coefficient

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between two sliding surfaces. A composition can be effective at preventing *adsorption* of proteins to a surface, as disclosed in Hubbell, but not be useful at *reducing friction* between two surfaces. Thus the mere disclosure in Hubbell that the application of a given copolymer was effective at preventing fouling does not provide one of ordinary skill in the art with an expectation that the method defined by the pending claims will be effective at reducing the friction coefficient between two sliding surfaces. Singh does not make up for the deficiencies of Hubbell. Singh discloses probe sets for the detection of binding of or interaction between one or more ligands by releasing identifying tags when such target recognition occurs (abstract). Singh is relied on by the Examiner solely for the disclosure that biotin may be used as a receptor ligand. Singh does not disclose or suggest placing a lubricating composition between two sliding surfaces. Therefore the combination of Hubbell with Singh would not make claims 9 and 10 obvious.

Additional Amendments to the claims

New dependent claim 21 has been added, which further defines the structure of the graft copolymer of claim 12. Support for this claim can be found in the specification at least at page 6, lines 6-16.

New dependent claims 22-25 have been added which further define the non-interactive side chains as neutral water-soluble polysaccharides (claims 22 and 24), which comprise dextran (claims 23 and 25). Support for these claims can be found in the specification at least at page 8, lines 20-22.

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Allowance of claims 1-14, 16-18 and 21-25, as amended, is respectfully solicited.

Respectfully submitted,

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